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EXAMINER	
CHU, CHRIS H	

ART UNIT	PAPER NUMBER
2874	

DATE MAILED: 01/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/669,130	SHPANTZER ET AL.	
	Examiner	Art Unit	
	Chris H. Chu	2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-93 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-93 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 06 January 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 9/05.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

The prior art documents submitted by applicant in the Informational Disclosure Statement filed on September 12, 2005 have all been considered and made of record (note the attached copy of form PTO-1449).

Drawings

Nine (9) sheets for formal drawings were filed January 6, 2004 and have been accepted by the Examiner.

Specification

Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

Claims 14 is objected to because of the following informalities:

- "is" in line 2 should be "are."
- there should not be a period in the middle of a sentence (after "electrodes" in line 2). Appropriate correction is required for claim 14 as well as any subsequent claims.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 5, 8-11, 23, 31-36 and 55 are rejected under 35 U.S.C. 102(b) as being anticipated by Delavaux (5,060,312).

Regarding claims 1 and 23, Delavaux discloses an optical device (phase diversity hybrid 160 in Fig. 2) with first and second inputs, comprising:

- a first coupler (162 in Fig. 2) coupled to the first input and producing at least a first and second output;
- a second coupler (164 in Fig. 2) coupled to the second input and producing at least a first and second output;
- a third coupler (170 in Fig. 2) coupled to the first output of the first coupler and to the first output of the second coupler;
- a fourth coupler (172 in Fig. 2) coupled to the second output of the first coupler and to the second output of the second coupler;
- first and second crossing waveguides with an angle selected to minimize crosstalk and losses between the first and second cross waveguides, the first crossing waveguide connecting one of the first or second outputs from the first coupler with an input of the fourth coupler, the second crossing waveguide connecting one of the first or second outputs from the second

coupler with an input of the third coupler in Fig. 2 and column 7, lines 67-68 to column 8, lines 1-2; and

- a first phase shifter (166 in Fig. 2) coupled to the first and second waveguides, the first and second waveguides connecting one of the outputs of the first or second coupler and one of the inputs of the third or fourth couplers and a second phase shifter (168 in Fig. 2), wherein the first, second, third and fourth couplers, the two crossing waveguides and the phase shifter are each formed as part of a single planar chip made of an electro-optical material in column 3, lines 8-13 and Fig. 2.

Regarding claims 5 and 36, Delavaux discloses an optical device further comprising a substrate in column 3, lines 8-13 and Fig. 2.

Regarding claims 8 and 9, Delavaux discloses an optical device wherein the first and second couplers are Y-junctions in Fig. 2.

Regarding claim 10, Delavaux discloses an optical device further comprising a second phase shifter coupled to the first and second waveguides (168 in Fig. 2).

Regarding claim 11, Delavaux discloses an optical device wherein the first, second, third and fourth couplers are 3-dB devices in column 1, lines 58-60.

Regarding claims 31-35, applicant is claiming the product including the process of making the optical device, and therefore are of "product-by-process" nature. The courts have been holding for quite some time that: the determination of the patentability of product-by-process claim is based on the product itself rather than on the process by which the product is made. In re Thrope, 777 F. 2d 695, 227 USPQ 964 (Fed. Cir.

1985); and patentability of claim to a product does not rest merely on a difference in the method by which that product is made. Rather, it is the product itself which must be new and unobvious. Applicant has chosen to claim the invention in the product form. Thus a prior art product which possesses the claimed product characteristics can anticipate or render obvious the claim subject matter regardless of the manner in which it is fabricated. A rejection based on 35 U.S.C. section 102 or alternatively on 35 U.S.C. section 103 of the status is eminently fair and acceptable. In re Brown and Saffer, 173 USPQ 685 and 688; In re Pilkington, 162 USPQ 147. As such no patentable weight is given to the process steps recited in claims 31-35.

Regarding claim 55, Delavaux discloses an optical communication system comprising a transmitter (see abstract) and a receiver (see rejection of claim 1 above).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2-4, 6, 7, 22, 24-30, 37 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Delavaux (5,060,312).

Regarding claims 2-4, Delavaux teaches the claimed invention but does not specifically state the optical device used as a free-space optical link device, an optical pointing device or as a tracking device. However, it has been held that a recitation with

respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham, 2 USPQ2d 1647 (1987).*

Regarding claims 6, 7 and 27-30, Delavaux teaches the claimed invention but does not specifically state the chip to be made of a semiconductor material selected from Si and InP or a ferroelectric material selected from $LiNbO_3$ and $LiTaO_3$ cut at X, Y or Z planes. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use those materials since it is well known to use semiconductor or ferroelectric materials for the purpose of creating chips.

Regarding claims 22 and 24-26, Delavaux teaches the claimed invention but does not disclose the first and second phase shifters to be adjustable or include phase shifting electrodes. However, phase shifters that are adjustable using voltages to control the electrodes are known in the art and it would have been obvious to one having ordinary skill in the art at the time the invention was made to use adjustable phase shifters with electrodes since providing the capability to be adjustable would always be beneficial.

Regarding claims 37 and 38, Delavaux teaches the claimed invention but does not specifically state the chip to include a substrate coated with a buffer wherein the buffer is silicon dioxide. However, it is well known that conventional chips have a substrate coated with a buffer layer of silicon dioxide and one having ordinary skill in the art at the time the invention was made would have found it obvious to use such a conventional chip.

Claims 12-21, 39, 40, 42, 53 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Delavaux (5,060,312) in view of Schlaak (DE 3442988 A1).

Regarding claims 13-15, 17, 18, 20 and 21, Delavaux teaches the claimed invention except for electrodes used to adjust the couplers. Schlaak teaches an independently adjustable coupler having biased electrodes in the abstract. Schlaak also teaches the electrodes to have alternating polarity and are split into an even integer number of sections to provide voltages having a reversed polarity in the abstract and Fig. 1. Schlaak also teaches the electrodes being used to control the output power ratio. Though Schlaak does not specifically state the electrodes configured to optimize a splitting operation point, it would have been obvious to one having ordinary skill in the art to do so, since optimizing the performance of any feature would always be beneficial. Since both inventions are coupler devices, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use electrodes with the coupler as disclosed by Schlaak in the optical device disclosed by Delavaux for the purpose of providing the capability to control the power splitting at the output.

Regarding claims 12 and 16, Delavaux teaches the claimed invention except for the chip being a two-layer structure. Schlaak teaches a coupler on a chip having two layers in Fig. 1. Schlaak also teaches the coupler to be on one layer, while the electrodes are formed in an adjacent second layer. Since both inventions are coupler devices, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a two layer chip as disclosed by Schlaak in the optical device disclosed by Delavaux for the purpose of providing the electrodes on a separate

layer in order to allow the electrodes to be electrically connected to wires, for example. It would also have been obvious to one having ordinary skill in the art to place the phase shifters disclosed by Delavaux in this second layer since they are also electrically controlled.

Regarding claim 19, the proposed combination of Delavaux and Schlaak teaches the claimed invention but does not disclose the electrodes to be of a push-pull configuration. However, electrodes that are of a push-pull configuration are known in the art and it would have been obvious to one having ordinary skill in the art at the time the invention was made to use them since they provide certain advantages such as increasing the linearity and range of modulation.

Regarding claims 39, 40 and 42 Delavaux teaches a method of transmission, comprising an optical device with first, second, third and fourth couplers, two crossing waveguides and first and second phase shifters formed as part of a single planar chip made of an electro-optical material in Fig. 2. Delavaux does not teach applying a voltage to the couplers to maintain a desired power splitting ratio. Schlaak teaches applying a voltage to the couplers to maintain a desired power splitting ratio in the abstract. Since both inventions are coupler devices, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply a voltage to the couplers as disclosed by Schlaak in the optical device disclosed by Delavaux for the purpose of providing the capability to control the power splitting at the output.

Regarding claims 53 and 54, the proposed combination of Delavaux and Schlaak teaches the claimed invention but does not specifically state the transmission applied to

a ladar application or for spectral analysis. However, it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham, 2 USPQ2d 1647 (1987).*

Claims 41 and 43-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Delavaux (5,060,312) in view of Schlaak (DE 3442988 A1), further in view of Hurrell et al. (US 2004/0160661).

Regarding claims 41 and 43-48, the combination of Delavaux and Schlaak teaches the claimed invention except for disclosing the optical device used for quadrature related modulation. Hurrell et al. teaches a method of optical transmission wherein offset voltages are applied to the phase shifters to provide a desired phase relationship between in-phase and in-quadrature signals in paragraph 25, lines 5-8. Hurrell et al. also discloses a feedback control loop which produces an error signal from a processing device that samples of the in-phase and in-quadrature signals used to control the couplers and the phase shifters in paragraph 24, lines 1-11. Hurrell et al. does not specifically state optimizing an average optical power at outputs of the in-phase and in-quadrature signals. However, it would have been obvious for one having ordinary skill in the art to do so since optimization would always be considered beneficial. Since all the inventions are optical devices, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a feedback control loop that produces an error signal used to control the phase shifters to provide a desired phase relationship of in-phase and in-quadrature signals as disclosed by Hurrell

et al. in the optical device disclosed by the combination of Delavaux and Schlaak for the purpose of providing an optical demodulator for quadrature related modulation.

Regarding claims 49 and 50, the proposed combination of Delavaux, Schlaak and Hurrell et al. teaches the claimed invention but does not disclose a converter that provides rates that are at least equal to a bandwidth of a signal. However, converters with such sampling rates are widely known and therefore it would have been obvious to one having ordinary skill in the art to use such a converter with the optical device in order to process signals at high bandwidths.

Regarding claims 51 and 52, the proposed combination of Delavaux, Schlaak and Hurrell et al. discloses the transmission to be in free space or with a fiber in the "Background of the Invention" section, paragraphs 3 and 4.

Claims 56-90 are rejected under 35 U.S.C. 103(a) as being unpatentable over Delavaux (5,060,312) in view of Yao (5,654,818).

Regarding claim 56, Delavaux teaches the claimed invention except for the details of the transmitter used with the receiver. Yao teaches a Mach-Zehnder modulator (22 in Fig. 3) that produces a first output, a second Mach-Zehnder modulator (24 in Fig. 3) that produces a second output, a splitter (12 in Fig. 3) coupled to the first and second Mach-Zehnder modulators, a combiner (12' in Fig. 3) that combines the first and second outputs; and a phase shifter (polarization rotator 52 in Fig. 3) coupled to the first and second Mach-Zehnder modulators. Yao does not specifically disclose the components formed on a single planar chip made of electro-optical material. However, it would have been obvious to one having ordinary skill in the art to do so since it is well

known in the art and also since conserving space would always be beneficial. Since both inventions are optical devices, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use transmitter as disclosed by Yao in the optical device disclosed by Delavaux for the purpose of providing a transmitter that is polarization independent which is critical when the laser source is located a distance away from the modulator.

Regarding claims 57-59 and 80, Yao teaches the claimed invention but does not specifically state the chip to be made of a single piece of crystal selected from $LiNbO_3$ or $LiTaO_3$ cut at X, Y or Z planes. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use those materials since it is well known to use the listed materials for the purpose of creating chips.

Regarding claims 60-63 and 71, Yao discloses an optical system wherein the splitter and combiner are both Y-junction and waveguide couplers in Fig. 3. The splitter is also shown to be at the input of the system and the combiner at the output of the system in Fig. 3.

Regarding claims 64 and 65, Yao discloses an optical system wherein the first and second Mach-Zehnder modulators have bias electrodes coupled to them in Fig. 3.

Regarding claims 66 and 70, Yao teaches the claimed invention but does not specifically state the first and second modulators with the first and second electrodes to be push-pull configuration. However, modulators of a push-pull type are well known and one having ordinary skill in the art at the time the invention was made would have

found it obvious to use push-pull modulators and electrodes since they eliminate chirp and improve the quality of the optical signal.

Regarding claim 67, Yao teaches the claimed invention but does not specifically state the first and second electrodes configured to optimize a DC bias point of the first and second Mach-Zehnder modulators. However, it is well known to use a DC bias voltage to control the operation of the modulator at the optimum value and one having ordinary skill in the art at the time the invention was made would have found it obvious to provide a bias voltage to the electrodes to prevent the bias point from drifting away from the optimum value.

Regarding claims 68 and 69, Yao teaches the claimed invention but does not specifically state the splitter and combiner to be adjustable. However, one having ordinary skill in the art at the time the invention was made would have found it obvious to make the splitter and combiner adjustable since it is known in the art to do so for example to reduce distortion of the signal.

Regarding claim 72, Yao teaches the claimed invention but does not specifically state the splitter and combiner to be 3-dB devices. However, splitters and combiners that are 3-dB devices are well known and generally conventional and one having ordinary skill in the art at the time the invention was made would have found it obvious to use such a conventional splitter or combiner.

Regarding claim 73, Yao discloses an optical system wherein the first and second Mach-Zehnder modulators are driven by an RF signal (see 20 in Fig. 3).

Regarding claims 74 and 75, Yao discloses an optical system wherein the first and second Mach-Zehnder modulators are coplanar and are associated with at least a first and second waveguide in Fig. 3.

Regarding claims 76 and 77, the proposed combination of Delavaux and Yao teaches the claimed invention but does not disclose the phase shifter to be of a push-pull configuration or to include an electrode. However, phase shifters with a bias electrode that are of a push-pull configuration are known in the art and it would have been obvious to one having ordinary skill in the art at the time the invention was made to use push-pull phase shifters since they provide certain advantages such as increasing the linearity and range of modulation.

Regarding claim 78, Yao discloses an optical system wherein the splitter divides the input beam into substantially equal first and second beams in column 4, lines 37-39.

Regarding claim 79, Yao discloses an optical system wherein the first and second Mach-Zehnder modulators are independently modulatable in column 5, lines 45-49.

Regarding claims 81-84, applicant is claiming the product including the process of making the optical device, and therefore are of "product-by-process" nature. The courts have been holding for quite some time that: the determination of the patentability of product-by-process claim is based on the product itself rather than on the process by which the product is made. In re Thrope, 777 F. 2d 695, 227 USPQ 964 (Fed. Cir. 1985); and patentability of claim to a product does not rest merely on a difference in the method by which that product is made. Rather, it is the product itself which must be

new and unobvious. Applicant has chosen to claim the invention in the product form. Thus a prior art product which possesses the claimed product characteristics can anticipate or render obvious the claim subject matter regardless of the manner in which it is fabricated. A rejection based on 35 U.S.C. section 102 or alternatively on 35 U.S.C. section 103 of the status is eminently fair and acceptable. In re Brown and Saffer, 173 USPQ 685 and 688; In re Pilkington, 162 USPQ 147. As such no patentable weight is given to the process steps recited in claims 81-84.

Regarding claims 85 and 86, Yao teaches the claimed invention but does not specifically state the chip to include a substrate coated with a buffer wherein the buffer is silicon dioxide. However, it is well known that conventional chips have a substrate coated with a buffer layer of silicon dioxide and one having ordinary skill in the art at the time the invention was made would have found it obvious to use such a conventional chip.

Regarding claims 87-90, the proposed combination of Delavaux and Yao teaches the claimed invention except for a multiplexer, optical repeater, amplifier and filter coupled to the transmitter and receiver of the optical communication system. However, all of these devices are well known in the art and one having ordinary skill in the art at the time the invention was made would have found it obvious to incorporate into the optical communication system a multiplexer to multiplex the signal, an optical repeater to regenerate the signal, an amplifier to boost the signal, and a filter to pass only certain desired frequency bands.

Claims 91-93 are rejected under 35 U.S.C. 103(a) as being unpatentable over Delavaux (5,060,312) in view of Lee et al. (US 2004/0208414).

Regarding claims 91-93, Delavaux teaches the claimed invention except for the details of the transmitter used with the receiver. Lee et al. teaches a transmitter comprising four Mach-Zehnder modulators (114, 118, 114' and 118; in Fig. 3) that each produce an output, a first input splitter (106 in Fig. 3) coupled to the first and second Mach-Zehnder modulators, a first combiner (176 in Fig. 3) positioned to combine the first and second outputs, a second input splitter (106' in Fig. 3) coupled to the third and fourth Mach-Zehnder modulators, a second combiner (176' in Fig. 3) positioned to combine the third and fourth outputs, phase shifters (see paragraph 72) coupled to the Mach-Zehnder modulators, and a third input splitter (103 in Fig. 3) coupled to the first and second input splitters, which are formed as part of a single chip (see abstract). Since both inventions are optical devices, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use transmitter as disclosed by Lee et al. in the optical device disclosed by Delavaux for the purpose of providing a transmitter that generates time division multiplexed signals.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chris H. Chu whose telephone number is 571-272-8655. The examiner can normally be reached on 8:30 AM - 5:00 PM Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on 571-272-2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general or clerical nature should be directed to the Technology Center 2800 receptionist at telephone number (571) 272-1562.

Chris H. Chu
Patent Examiner
January 19, 2006

MICHELLE CONNELLY-CUSHWA
PRIMARY EXAMINER
1/23/06